

NOSB NATIONAL LIST FILE CHECKLIST

CROPS

MATERIAL NAME: #18 Sodium Bicarbonate



NOSB Database Form



References



MSDS (or equivalent)



TAP Reviews from: Eric Sideman, Walter
Jeffery

NOSB/NATIONAL LIST COMMENT FORM CROPS

Material Name: #18 Sodium Bicarbonate

Please use this page to write down comments, questions, and your anticipated vote(s).

COMMENTS/QUESTIONS:

1. In my opinion, this material is:
_____ Synthetic _____ Non-synthetic.

2. This material should be placed on the proposed National List as:
_____ Prohibited Natural _____ Allowed Synthetic.

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: 9-15-95

Name of Material: Sodium Bicarbonate

Reviewer Name: Eric Sideman

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

☒ Synthetic Allowed ☐ Prohibited Natural

or, ☐ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

No

Please comment on the accuracy of the information in the file:

Under 'persistence' you should add the sodium ion (Na^+) to the breakdown products... Now you just mention the fate of the HCO_3^- .

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ☐ Yes; ☒ No

Signature Eric Sideman Date 8/30/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

- (1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

None

- (2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

No risk

- (3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

Minimal

- (4) the effect of the substance on human health;

It is used in cooking cakes & cookies . . .

- (5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

At the rates used there will be no effect

- (6) the alternatives to using the substance in terms of practices or other available materials; and

Sulfur, copper, & most important, Sanitation and crop rotation.

- (7) its compatibility with a system of sustainable agriculture.

No problems

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Sept 15, 1995

Name of Material: Sodium Bicarbonate

Reviewer Name: WALTER JEFFERY

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

Produced as described in the second paragraph of "how made" using, generally, a pure soda ash as the starter.

This material should be added to the National List as:

☒ Synthetic Allowed ☐ Prohibited Natural

or, ☐ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Please comment on the accuracy of the information in the file:

Is an ingredient in baking powder & sort of critical to some baking processes - even organic ones.

seems reasonable as except as noted.

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ☐ Yes; ☒ No

Signature

Walter Jeffery

Date

9/8/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

- (1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

Not likely.

- (2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

Non toxic, breakdown products are CO₂ and the Sodium Salt of some acid that caused the breakdown

- (3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

not likely

- (4) the effect of the substance on human health;

- (5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

- (6) the alternatives to using the substance in terms of practices or other available materials; and

- (7) its compatibility with a system of sustainable agriculture.

Sodium Bicarbonate

As noted earlier, sodium bicarbonate (nahcolite) occurs as an essentially pure mineral in some deserts (i.e., the Piceance Creek Basin), as a companion material with trona in other pure deposits (i.e., Wucheng, China), and as one component with many other salts in other deposits (i.e., brines). It is recovered directly as a sodium bicarbonate product only in the Piceance Creek Basin, but all the brine operations crystallize NaHCO_3 as an intermediate material in the production of soda ash. Some of this sodium bicarbonate has also been sold as an industrial or feed-grade material. Because NaHCO_3 strongly adsorbs organic matter and its poor crystal shape results in considerable brine entrainment upon being dewatered, its direct production from any deposit always results in an impure product. To produce a pure material the brine must be specially treated, which is usually difficult, so it is normally produced from pure soda ash. In such a production the filtrate must be recycled or other steps taken to avoid the initial formation of sesquicarbonate. Obtaining good crystals is also important, as is a low brine holdup (by washing and/or a low moisture content) during dewatering. Drying must be done carefully to avoid decomposition by having the entering heating air below 100°C and the exiting air below 50°C .

References

1. D. E. Garrett, *Natural Soda Ash: Occurrences, Processing and Use*, Van Nostrand-Reinhold, New York, 1992.
2. W. C. Culbertson, 1971. "Stratigraphy of the Trona Deposits in the Green River Formation, Southwest Wyoming," *Contributions to Geology, Trona Issue*, Univ. of Wyoming, 10, No. 1, pp. 15-24 (1971).

DONALD E. GARRETT

Sodium Chlorate

Introduction

Sodium chlorate, NaClO_3 , a powerful oxidizing agent, is produced industrially by the electrolysis of sodium chloride solutions, as described by reaction (1):

own lethal dose of sodium carbonate/kg (rat, oral). Toxic effects under normal working conditions. Ingestion of > 15 g is potentially dangerous. Vomiting should be induced with copious amounts of water or juice or vinegar (two table-spoons of water) should be drunk. The patient should be irrigated for 15 min at intervals; but use of this method is strongly contraindicated in the presence of perforation. Medical attention is necessary. If skin is attacked, the affected area should be thoroughly washed with water, and a nonirritant emollient should be applied. If eyes are splashed with the solution, the eyelids should be closed and the eye is treated for several minutes with water or saline solution. Medical attention should be sought from a specialist.

Aspects

The soda ash content of the soda ash increased continuously from 1950 until 1975. The figures (in 10⁶ t) are given in Table 1.

1965	16.6
1970	20.0
1975	24.9
1980	28.9
1985	29.4
1990	32.3

are listed in Table 2. The soda ash produced from trona in the United States is given in Table 3.

Year	Soda ash produced from trona (10 ⁶ t)
1965	16.6
1970	20.0
1975	24.9
1980	28.9
1985	29.4
1990	32.3

15% in 1960, to 70% in 1975, and 100% since 1986. In 1991, 28% of worldwide soda ash capacity was based on trona or other minerals containing sodium carbonate [15].

2. Sodium Hydrogencarbonate

2.1. Properties

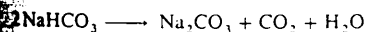
Some physical properties of sodium hydrogencarbonate are given below:

M_r	84.007
Density	2.22 g/cm ³
Specific heat capacity (25 °C)	87.7 kJ mol ⁻¹ K ⁻¹
Enthalpy of solution	-18 kJ/mol
Enthalpy of formation	950 kJ/mol
Refractive indices	1.380, 1.500, 1.586
Dielectric constant (25 °C)	4.39

Solubility properties are listed in Table 5. Solubility is lower in the presence of sodium carbonate.

In the system H₂O-NaHCO₃-Na₂CO₃, the double salt trona NaHCO₃·Na₂CO₃·2H₂O occurs at > 21.3 °C. The isotherms at 24.9 °C, 30 °C, and 50 °C are shown in Figure 11, which indicates the ranges of existence of the solid phases at these temperatures [29], [30].

On heating, sodium hydrogencarbonate decomposes into sodium carbonate, carbon dioxide, and water:



Dissociation pressures of carbon dioxide at equilibrium are as follows:

T/°C	30	50	70	90	100	110
p_{CO_2} /kPa	0.825	3.99	16.013	55.102	97.236	166.596

At room temperature, sodium hydrogencarbonate is fairly stable because of its low rate of

Table 5. Solubility of sodium hydrogencarbonate in water

T/°C	Solubility	
	g/100 g solution	g/100 g H ₂ O
25	6.26	6.68
30	6.4	6.9
35	7.6	8.2
40	8.7	9.6
45	10.0	11.1
50	11.3	12.7
55	12.7	14.5
60	14.2	16.5
65	16.5	19.7
70	19.1	23.6

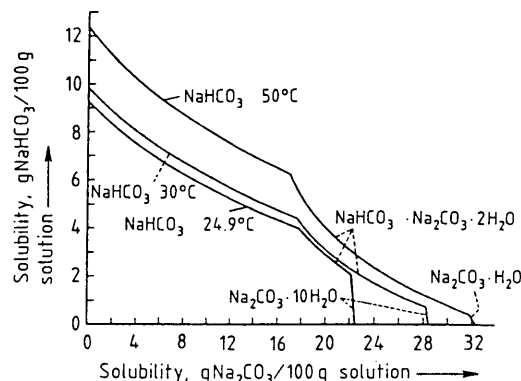
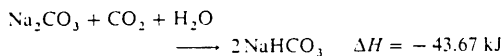


Figure 11. Solubilities in the system H₂O-NaHCO₃-Na₂CO₃ at 24.9 °C, 30 °C, and 50 °C [29]

decomposition. The aqueous solution has an only slightly alkaline reaction due to the small extent of hydrolysis.

2.2. Production

Sodium hydrogencarbonate is an intermediate in the ammonia-soda process. However, because of the content of ammonium salts, a product that satisfies the quality requirements of consumers (mainly in the food industry) cannot be obtained by drying crude bicarbonate. Moreover, a sufficiently pure product cannot be obtained by recrystallization. Therefore, it is necessary to start with an aqueous solution of sodium carbonate which is obtained either by dissolving calcined soda ash or by decomposing crude bicarbonate with steam. This is then filtered and carbonated with pure concentrated carbon dioxide, with cooling to remove the heat of reaction:



As carbonation proceeds, sodium hydrogencarbonate precipitates. It is recovered by centrifuging and then dried with hot air (e.g., in tray dryers).

2.3. Uses and Quality Specifications

Sodium hydrogencarbonate is used in the manufacture of baking powder, as a medicament for neutralizing stomach acid, as a component of

Identification

Common Name	Sodium Bicarbonate	Chemical Name	NaHCO ₃
Other Names	Baking Soda, Sodium Acid Carbonate		
Code #: CAS	00144-55-8	Code #: Other	NIOSH# VZ0950000
N. L. Category	Synthetic Allowed	MSDS	yes

Chemistry

Family

Composition NaHCO₃

Properties Odorless white crystalline powder. Stable in dry air, but decomposes in moist air. Alkaline. Moderate solubility, specific gravity 2.16, melting point 50 C.

How Made

In the US the main source is natural deposits of trona ore. Also can be from natural brine (In Searles Lake in California). Trona ore (sodium sesquicarbonate) is heated and then mixed with water to dissolve the soda ash and to separate out insoluble impurities. Then concentrated by evaporation to crystallization.

Sodium bicarbonate (baking soda) is prepared by adding the carbon dioxide in the kiln gas to a saturated pure sodium carbonate solution. The bicarbonate formed precipitates out of the solution.

Use/Action

Type of Use Crops

Use(s) disease control

Action**Combinations****Status****OFPA****N. L. Restriction****EPA, FDA, etc****Safety Guidelines****Directions****Registration****State Differences****Historical status****International status**

OFPA Criteria

2119(m)1: chemical interactions

2119(m)2: toxicity & persistence

LD50 (Oral-Rat) (Mg/Kg): 4220. No carcinogenicity. Breaks down into carbon dioxide and carbon monoxide.

2119(m)3: manufacture & disposal consequences

2119(m)4: effect on human health

Dust may irritate skin or eyes.

2119(m)5: agroecosystem biology

2119(m)6: alternatives to substance

Sulfur, oils, cultural practices.

2119(m)7: Is it compatible?

References

MSDS for SODIUM BICARBONATE

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM BICARBONATE

FORMULA: NaHCO_3

FORMULA WT: 84.01

CAS NO.: 00144-55-8

NIOSH/RTECS NO.: VZ0950000

COMMON SYNONYMS: BAKING SODA; SODIUM ACID CARBONATE

PRODUCT CODES: 3509,3508,3506

EFFECTIVE: 03/20/86

REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE

FLAMMABILITY - 0 NONE

REACTIVITY - 1 SLIGHT

CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION

MAY CAUSE IRRITATION DURING USE

AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
NOT APPLICABLE		

3 - PHYSICAL DATA

BOILING POINT: N/A

VAPOR PRESSURE(MM HG): N/A

MELTING POINT: 50 C (122 F)

VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 2.16
(H₂O=1)

EVAPORATION RATE: N/A
(BUTYL ACETATE=1)

SOLUBILITY(H₂O): MODERATE (1 TO 10 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: ODORLESS WHITE CRYSTALLINE POWDER.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP) N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

5 - HEALTH HAZARD DATA

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 4220

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE: DUST MAY IRRITATE SKIN OR EYES.

TARGET ORGANS: NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: NONE IDENTIFIED

ROUTES OF ENTRY: NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, HUMIDITY

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION
TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION
CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS
HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE
RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE
AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

